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IS 3961-2 (1967): Recommended current ratings for cables,
Part 2: PVC insulated and PVC sheathed heavy duty cables
[ETD 9: Power Cables]



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“Knowledge is such a treasure which cannot be stolen”

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IS : 3961 (Part II) - 1967
(Reaffirmed 1996)

Indian Standard

**RECOMMENDED CURRENT
RATINGS FOR CABLES**

**PART II PVC-INSULATED AND PVC-SHEATHED
HEAVY DUTY CABLES**

Part

(Tenth Reprint DECEMBER 2000)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard
**RECOMMENDED CURRENT
 RATINGS FOR CABLES**
**PART II PVC-INSULATED AND PVC-SHEATHED
 HEAVY DUTY CABLES**

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AMENDMENT NO. 1 SEPTEMBER 1974

TO

IS : 3961 (Part II)-1967 RECOMMENDED CURRENT RATINGS FOR CABLES

PART II PVC-INSULATED AND PVC-SHEATHED HEAVY DUTY CABLES

Addenda

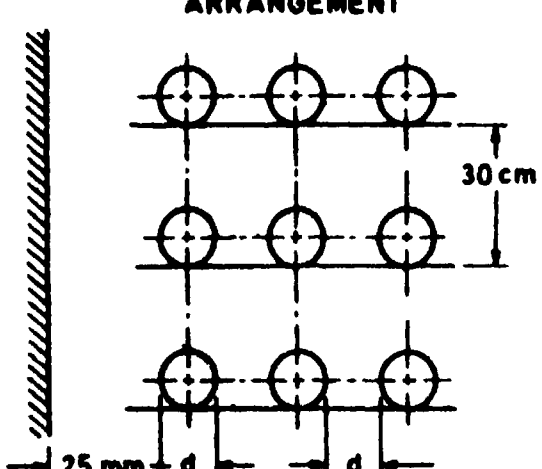
(Page 8, clause 5.1.3) — Add the following matter at the end of the clause:

- c) For multi-core cables laid on racks in air (with spacing between cables equal to diameter of the cable and with cables touching) Tables 19 and 20

(Page 21, Table 18) — Add the following new tables at the end:

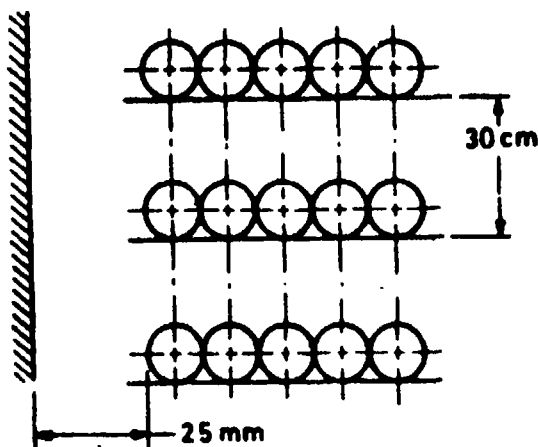
**TABLE 19 RATING FACTORS FOR MULTI-CORE CABLES
LAID ON RACKS IN AIR (WITH SPACING BETWEEN
CABLES EQUAL TO DIAMETER OF THE CABLE)**

[Clause 5.1.3 (c)]

ARRANGEMENT		No. of RACKS	NUMBER OF CABLE PER RACK				
	1		2	3	6	9	
	1	1.00	0.98	0.96	0.93	0.92	
	2	1.00	0.95	0.93	0.90	0.89	
	3	1.00	0.94	0.92	0.89	0.88	
	6	1.00	0.93	0.90	0.87	0.86	

**TABLE 20 RATING FACTORS FOR MULTI-CORE CABLES LAID ON RACKS
IN AIR (WITH CABLES TOUCHING)**

[Clause 5.1.3 (c)]

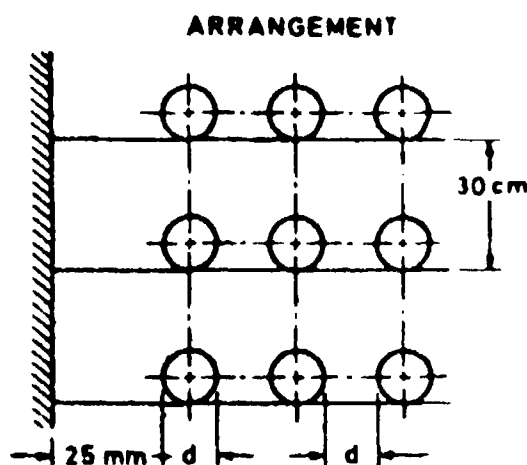
ARRANGEMENT		NUMBER OF CABLE PER RACK				
	No. of RACKS	1	2	3	6	9
	1	1.00	0.84	0.80	0.75	0.73
	2	1.00	0.80	0.76	0.71	0.69
	3	1.00	0.78	0.74	0.70	0.68
	6	1.00	0.76	0.72	0.68	0.66

(ETDC 32)

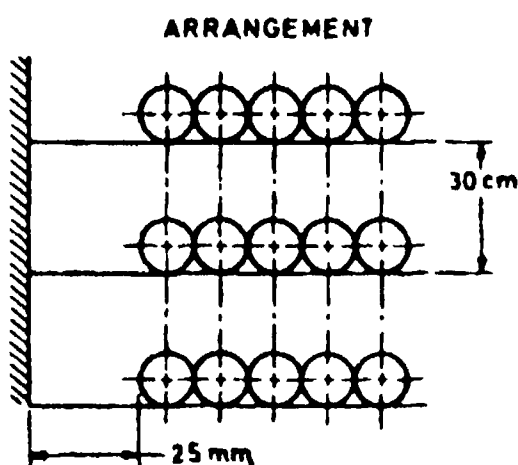
AMENDMENT NO. 2 JULY 1977
TO
IS : 3961 (Part II)-1967 RECOMMENDED
CURRENT RATINGS FOR CABLES
PART II PVC-INSULATED AND PVC-SHEATHED
HEAVY DUTY CABLES

Alterations

[Page 21, Table 19 (see Amendment No. 1)] — Substitute the following for the existing Fig:



[Page 21, Table 20 (see Amendment No. 1)] — Substitute the following for the existing Fig:



Addenda

[Page 21, Table 19 (see Amendment No. 1)] — Add the following new Note in the table:

‘ NOTE — The racks are of open type. ’

[Page 21, Table 20 (see Amendment No. 1)] — Add the following new Note at bottom in the table:

‘ NOTE — The racks are of open type. ’

(ETDC 32)

Indian Standard
**RECOMMENDED CURRENT
RATINGS FOR CABLES
PART II PVC-INSULATED AND PVC-SHEATHED
HEAVY DUTY CABLES**

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 26 June 1967, after the draft finalized by the Conductors and Cables Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard has been drawn up to provide to the users general guidance for loading of cables. The overloading of cables will reduce the life expectancy of the cable and at the same time under-loading it will mean uneconomic utilization of its capacity. Depending upon the loading cycle met with in practice, the installation engineer may decide the economic loading of cables.

0.3 The current ratings given in the standard have been drawn up on certain assumptions pertaining to soil conditions prevalent in this country, permissible temperature-rise of insulating materials, conductor, etc. It is, however, to be expected that these conditions may be somewhat different in different places in a vast country like ours. In such cases the installation engineer is expected to keep in mind the loading conditions, the soil and atmospheric conditions in the area, etc, before deciding on the choice of the proper size of cable.

0.4 For cables laid direct and in underground ducts, ratings have been provided corresponding to the value for the thermal resistivity of the soil as 150°C cm/W as agreed to by IEC for tropical climates. This covers the value commonly encountered in India, but ratings corresponding to other values can be determined from rating factors given in Tables 6 to 13. It is, however, emphasized that actual measurements of soil thermal resistivity at the proposed depth of laying should be made along the route prior to laying the cables where practicable and the cable ratings based upon the values so determined.

0.5 The permissible current ratings have been specified for three commonly adopted conditions of installation, namely, laid direct in ground, laid in ducts, and for cables in air.

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0.6 This is one of the series of Indian Standards on recommended current ratings for various types of cables. Others in the series are:

IS : 3961 (Part I)-1967 Recommended current ratings for cables:
Part I Paper-insulated lead-sheathed cables.

IS : 3961 (Part III)-1967 Recommended current ratings for cables:
Part III Rubber-insulated cables.

IS : 3961 (Part IV)-1967 Recommended current ratings for cables:
Part IV Polythene-insulated cables.

IS : 3961 (Part V)-1967 Recommended current ratings for cables:
Part V PVC-insulated light duty cables and wires.

0.7 In preparing this standard assistance has been derived from the following:

Supplement to ERA Report F/T 183 Current ratings for armoured
PVC-insulated cables to B.S. 3346 : 1961. British Electrical and
Allied Industries Research Association, U.K.

IEE Wiring regulations. Institute of Electrical Engineers, U.K.

0.8 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers recommended current ratings for PVC-insulated and PVC-sheathed heavy duty cables covered by IS : 1554 (Part I)-1964† either laid direct in ducts or in air.

2. BASIC ASSUMPTIONS

2.1 The current ratings given in Tables 1 to 5 in the standard are based on the following assumptions:

i) Maximum conductor temperature	—	70°C
ii) Thermal resistivity of soil	-	150°C cm/W
iii) Thermal resistivity of PVC	-	650°C cm/W
iv) Ground temperature	—	30°C
v) Ambient air temperature	-	40°C

*Rules for rounding off numerical values (*revised*).

†Specification for PVC-insulated (heavy duty) electric cables: Part I For working voltages up to and including 1 100 volts (*revised*).

— 75 cm

- vi) Depth of laying (to the highest point of cable laid direct in the ground or to top surface of ducts)

NOTE — In the case of twin and multi-core cables with conductors of sizes 25 mm² and above, the current ratings given are for sector shaped conductors. For round conductors the current ratings would be somewhat lower.

3. METHOD OF INSTALLATION

3.1 The current ratings given in this standard are for methods of installation as given in the following table:

<i>Type of Cables</i>	<i>Type of Installation</i>	<i>Method of Installation</i>
Single-core cables	a) Laid direct in the ground	1) Three in close trefoil formation, or 2) Two touching in horizontal formation.
	b) In ducts	1) Three in trefoil formation, or 2) Two in horizontal formation.
	c) In air	1) Two single-core cables are installed one above the other fixed to a vertical wall as follows, the distance between the wall and the surface of the cable being 25 mm in each case: i) Cables of sizes up to and including 185 mm ² are installed at a distance between centres of twice the overall diameter of the cable. ii) Cables of sizes 240 mm ² and above are installed at a distance between centres of 90 mm.
Twin and multi-core cables		NOTE — The ratings for two cables may be applied with safety in cases where such cables are installed in horizontal formation, on brackets fixed to a wall, either spaced as indicated above or touching throughout. 2) Three single-core cables are installed in trefoil formation touching. Installed singly.

4. SIZES OF THE DUCTS

4.1 The current ratings specified in the tables applied to cables laid in ducts of inner diameter of 100 mm and 125 mm.

5. RATING FACTORS

5.1 The current ratings given in the respective tables apply under the conditions of installation mentioned above. Rating factors for various conditions are given in relevant tables as indicated below.

5.1.1 Cables Laid Direct in the Ground

- | | |
|---|----------------|
| a) For depth of laying | Table 6 |
| b) For variation in ground temperature | Table 7 |
| c) For variation in thermal resistivity of soil | Tables 8 and 9 |
| d) For group rating factors | Fig. 1 to 4 |

5.1.2 Cables Installed in Ducts

- | | |
|---|---------------------|
| a) For depth of laying | Table 10 |
| b) For variation in ground temperature | Table 11 |
| c) For variation in thermal resistivity of soil | Tables 12 and 13 |
| d) For cables in multiway ducts | Table 14 and Fig. 5 |
| e) For ducts in tier formation | Tables 15 and 16 |
| f) For ducts in horizontal formation | Fig. 6 and 7 |

5.1.3 Cables Installed in Air

- | | |
|--|----------|
| a) For variation in ambient air temperature | Table 17 |
| b) For three single-core cables in flat formation in air (with spacing as specified for two single-core cables in air) | Table 18 |

6. EFFECT OF GROUPING OF CABLES IN AIR

6.1 For cables of sizes up to 70 mm², no reduction in rating need be applied provided that the circuits are run with a clearance of at least 75 mm and provided that if the number of circuits exceeds three, they are installed in a horizontal plane. For cables of sizes above 70 mm², no reduction in rating need be applied provided that the circuits are run with a clearance of at least 150 mm, and provided that if the number of circuits exceeds four, they are installed in a horizontal plane.

7. CIRCUIT PROTECTION

7.1 PVC-insulated cables should not be operated, even for comparatively short durations, at temperature appreciably higher than that permissible for continuous operation, since the PVC insulation is liable to soften at higher temperatures and sustain serious damage.

7.2 It is, therefore, essential that such cables shall be continuously operated at the rated currents given in the tables only if they are suitably protected against excess currents arising out of fault conditions. It is assumed that duration of such faults does not exceed four hours and protection is considered to be adequate if the minimum current at which the protective device is designed to operate does not exceed 1.5^* times the tabulated ratings for cables laid in air or in ducts, and not more than 1.3^\dagger times the tabulated values for cables laid direct in the ground.

7.3 If by the nature of the circuit protection, it is not possible to operate the cable at the rated current under the foregoing provisions, the cable required for a given continuous load current shall be chosen to have a rating as given in the tables which shall be not less than:

- a) The given continuous load current, and
- b) For cables in air or in ducts, 0.67^* of the minimum current at which the excess current protection is designed to operate,

or

For cables laid direct in the ground, 0.77^\dagger of the minimum current at which excess current protection is designed to operate.

Examples:

1. A 3-core aluminium conductored cable of size 185 mm^2 laid direct in the ground can carry a continuous load current of 235 amperes (tabulated rating) if the excess current protection is designed to operate when current exceeds $1.3 \times 235 = 305$ amperes (Table 4, col 3).
2. For a continuous load current of 100 amperes per phase, a 3-core copper conductored cable of size 35 mm^2 installed in air (tabulated rating = 110 amperes) is adequate if the excess current protection is designed to operate when current exceeds $1.5 \times 110 = 165$ amperes. If the excess current protection is designed to operate when current exceeds say 200 amperes, a cable with a tabulated rating not less than $0.67 \times 200 = 135$ amperes will be necessary, that is, cable with size 50 mm^2 (Table 4, col 6).

*The factor applies to cables in ducts when ratings are based on a value of thermal resistivity of soil of 90°C cm/W or higher.

†This factor is applicable only when rating is based on a value of thermal resistivity of soil of 120°C cm/W or higher. Low factor is required for values of thermal resistivity of soil less than 120°C cm/W .

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3. For a continuous load current of 170 amperes single phase, aluminium conductored single-core cables of size 70 mm² laid in ground (tabulated rating) are adequate if excess current protection is designed to operate when current exceeds $1.3 \times 170 = 220$ amperes. If the excess current protection is designed to operate when current exceeds 300 amperes, cables with a tabulated rating not less than $0.77 \times 300 = 230$ amperes will be necessary, that is, cable with size 120 mm² (Table 1, col 3).

TABLE 1 CURRENT RATINGS (ac) FOR TWO SINGLE-CORE 650/1100 VOLTS UNARMoured OR NON-MAGNETIC ARMoured CABLES ACCORDING TO IS : 1554 (Part I)-1964

(Clauses 2.1 and 7.3)

NOMINAL AREA OF CONDUCTOR	LAID DIRECT IN THE GROUND		IN DUCTS		IN AIR	
	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
mm ²	A	A	A	A	A	A
1.5	25	21	23	19	24	18
2.5	35	28	31	25	32	25
4	46	36	42	33	43	32
6	57	44	54	42	54	41
10	75	59	72	56	72	56
16	94	75	92	71	92	72
25	125	97	120	93	125	99
35	150	120	140	110	155	120
50	180	145	165	130	190	150
70	220	170	200	155	235	185
95	265	205	230	180	275	215
120	300	230	255	200	310	240
150	340	265	280	220	345	270
185	380	300	305	240	390	305
240	420	335	340	270	445	350
300	465	370	370	295	500	395
400	500	410	405	335	570	455
500	540	435	430	355	610	490
625	590	485	465	395	680	560

NOTE 1 — For basic assumptions and method of installation see 2 and 3.

NOTE 2 — For information regarding circuit protection see 7.

TABLE 2 CURRENT RATINGS (ac) FOR THREE SINGLE-CORE 650/1 100 VOLTS UNARMoured OR NON-MAGNETIC ARMoured CABLES ACCORDING TO IS : 1554 (Part I)-1964

(Clause 2.1)

NOMINAL AREA OF CONDUCTOR	LAID DIRECT IN THE GROUND		IN DUCTS		IN AIR	
	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
mm ²	A	A	A	A	A	A
1.5	22	17	21	17	20	15
2.5	30	24	29	24	27	21
4	39	31	38	30	35	27
6	49	39	48	37	44	35
10	65	51	64	51	60	47
16	85	66	83	65	82	64
25	110	86	110	84	110	84
35	130	100	125	100	130	105
50	155	120	150	115	165	130
70	190	140	175	135	205	155
95	220	175	200	155	245	190
120	250	195	220	170	280	220
150	280	220	245	190	320	250
185	305	240	260	210	370	290
240	345	270	285	225	425	335
300	375	295	310	245	475	380
400	400	325	335	275	550	435
500	425	345	355	295	590	480
625	470	390	375	320	660	550

NOTE 1 — For basic assumptions and method of installation see 2 and 3.

NOTE 2 — For information regarding circuit protection see 7.

**TABLE 3 CURRENT RATINGS (ac) FOR TWIN 650/1 100 VOLTS
ARMOURED OR UNARMOURED CABLES ACCORDING
TO IS : 1554 (Part I)-1964**

(Clause 2.1)

NOMINAL AREA OF CONDUCTOR	LAID DIRECT IN THE GROUND		IN DUCTS		IN AIR	
	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
mm ²	A	A	A	A	A	A
1.5	23	18	20	16	20	16
2.5	32	25	27	21	27	21
4	41	32	35	27	35	27
6	50	40	44	34	45	35
10	70	55	58	45	60	47
16	90	70	75	58	78	59
25	115	90	97	76	105	78
35	140	110	120	92	125	99
50	165	135	145	115	155	125
70	205	160	180	140	195	150
95	240	190	215	170	230	185
120	275	210	235	190	265	210
150	310	240	270	210	305	240
185	350	275	300	240	350	275
240	405	320	345	275	410	325
300	450	355	385	305	465	365
400	490	385	425	345	530	420

NOTE 1 — For basic assumptions and method of installation see 2 and 3.

NOTE 2 — For information regarding circuit protection see 7.

NOTE 3 — The current ratings apply to cables with sector shaped conductors of sizes above 25 mm². For round conductors lower ratings shall be taken. This is also applicable to direct current ratings (Table 5).

TABLE 4 CURRENT RATINGS (ac) FOR THREE-, FOUR-, AND FIVE-CORE 650/1 100 VOLTS ARMoured OR UNARMoured CABLES ACCORDING TO IS : 1554 (Part I)-1964

(Clauses 2.1 and 7.3)

NOMINAL AREA OF CONDUCTOR	LAID DIRECT IN THE GROUND		IN DUCTS		IN AIR	
	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
mm ²	A	A	A	A	A	A
1.5	21	16	17	14	17	13
2.5	27	21	24	18	24	18
4	36	28	30	23	30	23
6	45	35	38	30	39	30
10	60	46	50	39	52	40
16	77	60	64	50	66	51
25	99	76	81	63	90	70
35	120	92	99	77	110	86
50	145	110	125	95	135	105
70	175	135	150	115	165	130
95	210	165	175	140	200	155
120	240	185	195	155	230	180
150	270	210	225	175	265	205
185	300	235	255	200	305	240
240	345	275	295	235	355	280
300	385	305	335	260	400	315
400	425	335	360	290	455	375

NOTE 1 — For basic assumptions and method of installation *see* 2 and 3.

NOTE 2 — For information regarding circuit protection *see* 7.

NOTE 3 — The current ratings apply to cables with sector shaped conductors of sizes above 25 mm². For round conductors lower ratings shall be taken.

NOTE 4 — In case of four- and five-core cables only three-cores are carrying full load current.

TABLE 5 CURRENT RATINGS (dc) FOR 650/1100 VOLTS ARMOURD OR UNARMOURD CABLES
ACCORDING TO IS: 1554 (Part D)-1964

(Clause 2.1)

NOMINAL AREA OF CONDUCTOR mm ²	LAID DIRECT IN THE GROUND				IN DUCTS				IN AIR			
	Two Singles		One Twin		Two Singles		One Twin		Two Singles		One Twin	
	Cop-	Alumi-	Cop-	Alumi-	Cop-	Alumi-	Cop-	Alumi-	Cop-	Alumi-	Cop-	Alumi-
	per A	nium A	per A	nium A	per A	nium A	per A	nium A	per A	nium A	per A	nium A
70	225	175	205	160	215	165	180	140	240	190	195	150
95	270	210	245	195	250	195	215	170	285	225	230	180
120	310	240	285	220	285	225	240	190	335	260	265	210
150	350	270	320	250	325	255	275	215	390	300	310	240
185	390	305	360	285	370	285	310	245	445	345	360	280
240	455	355	425	330	425	330	360	280	520	405	425	335
300	510	400	480	370	475	375	410	320	590	470	490	380
400	590	460	550	425	560	435	495	385	710	560	580	450
500	650	510	—	—	630	490	—	—	800	630	—	—
625	760	600	—	—	730	570	—	—	960	750	—	—

NOTE 1 — For basic assumptions and method of installation see 2 and 3.

NOTE 2 — For information regarding circuit protection see 7.

NOTE 3 — For conductor sizes smaller than 70 mm² the dc rating is the same as the ac rating (see Tables 1 and 3).

TABLE 6 RATING FACTORS FOR DEPTH OF LAYING (FOR 650/1 100 V CABLES LAID DIRECT IN THE GROUND)

[Clauses 0.4 and 5.1.1 (a)]

DEPTH OF LAYING cm	SIZE		
	Up to 25 mm ²	Above 25 mm ² Up to 300 mm ²	Above 300 mm ²
75	1.00	1.00	1.00
90	0.99	0.98	0.97
105	0.98	0.97	0.96
120	0.97	0.96	0.95
150	0.96	0.94	0.92
180 or more	0.95	0.93	0.91

TABLE 7 RATING FACTORS FOR VARIATION IN GROUND TEMPERATURE (FOR CABLES LAID DIRECT IN THE GROUND)

[Clauses 0.4 and 5.1.1 (b)]

GROUND TEMPERATURE °C	15	20	25	30	35	40	45
RATING FACTOR	1.17	1.12	1.06	1.00	0.94	0.87	0.79

TABLE 8 RATING FACTORS FOR VARIATION IN THERMAL RESISTIVITY OF SOIL (TWIN AND MULTI-CORE CABLES LAID DIRECT IN THE GROUND)

[Clauses 0.4 and 5.1.1 (c)]

NOMINAL AREA OF CONDUCTOR mm ²	FOR VALUES OF THERMAL RESISTIVITY OF SOIL IN °C cm/W					
	100	120	150	200	250	300
1.5	1.10	1.05	1.0	0.92	0.86	0.81
2.5	1.10	1.05	1.0	0.92	0.86	0.81
4	1.10	1.05	1.0	0.92	0.86	0.81
6	1.10	1.05	1.0	0.92	0.86	0.81
10	1.10	1.06	1.0	0.92	0.85	0.80
16	1.12	1.06	1.0	0.91	0.84	0.79
25	1.14	1.08	1.0	0.91	0.84	0.78
35	1.15	1.08	1.0	0.91	0.84	0.77
50	1.15	1.08	1.0	0.91	0.84	0.77
70	1.15	1.08	1.0	0.90	0.83	0.76
95	1.15	1.08	1.0	0.90	0.83	0.76
120	1.17	1.09	1.0	0.90	0.82	0.76
150	1.17	1.09	1.0	0.90	0.82	0.76
185	1.18	1.09	1.0	0.89	0.81	0.75
240	1.18	1.09	1.0	0.89	0.81	0.75
300	1.18	1.09	1.0	0.89	0.81	0.75
400	1.19	1.10	1.0	0.89	0.81	0.75

TABLE 9 RATING FACTORS FOR VARIATION IN THERMAL RESISTIVITY OF SOIL
(TWO AND THREE SINGLE-CORE CABLES LAID DIRECT IN THE GROUND)

[Clauses 0.4 and 5.1.1(c)]

NOMINAL AREA OR CONDUCTOR mm ²	TWO CABLES TOUCHING, FOR VALUES OF THERMAL RESISTIVITY OF SOIL IN °C cm/W						THREE CABLES IN TREFOIL TOUCHING, FOR VALUES OF THERMAL RESISTIVITY OF SOIL IN °C cm/W					
	100	120	150	200	250	300	100	120	150	200	250	300
1.5	1.15	1.08	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.90	0.82	0.76
2.5	1.15	1.08	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.90	0.82	0.76
4	1.15	1.08	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.90	0.82	0.76
6	1.15	1.08	1.00	0.91	0.84	0.78	1.18	1.09	1.00	0.90	0.82	0.76
10	1.15	1.08	1.00	0.90	0.83	0.77	1.18	1.09	1.00	0.89	0.81	0.75
16	1.17	1.09	1.00	0.90	0.83	0.77	1.19	1.09	1.00	0.89	0.81	0.74
25	1.18	1.09	1.00	0.90	0.82	0.76	1.19	1.09	1.00	0.88	0.80	0.74
35	1.18	1.09	1.00	0.90	0.82	0.75	1.20	1.09	1.00	0.88	0.80	0.74
50	1.18	1.09	1.00	0.90	0.82	0.75	1.20	1.09	1.00	0.88	0.80	0.74
70	1.19	1.09	1.00	0.89	0.81	0.74	1.21	1.10	1.00	0.88	0.80	0.74
95	1.19	1.09	1.00	0.89	0.81	0.74	1.22	1.10	1.00	0.88	0.80	0.74
120	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.74
150	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.73
185	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.73
240	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.73
300	1.21	1.10	1.00	0.89	0.80	0.74	1.22	1.10	1.00	0.88	0.79	0.72
400	1.21	1.10	1.00	0.88	0.80	0.74	1.24	1.11	1.00	0.88	0.79	0.72
500	1.21	1.10	1.00	0.88	0.80	0.74	1.24	1.11	1.00	0.88	0.79	0.72
625	1.22	1.10	1.00	0.88	0.80	0.74	1.24	1.11	1.00	0.88	0.79	0.72

**TABLE 10 RATING FACTORS FOR DEPTH OF LAYING
(650/1 100 VOLTS TWIN AND MULTI-CORE CABLES IN
SINGLE-WAY DUCTS)**

[*Clauses 0.4 and 5.1.2(a)*]

DEPTH OF LAYING cm	RATING FACTOR
75	1.00
90	0.99
105	0.98
120	0.97
150	0.96
180	0.95
270	0.92
360	0.91
450	0.90
540 or more	0.89

**TABLE 11 RATING FACTORS FOR VARIATION IN GROUND
TEMPERATURE (FOR CABLES IN DUCTS)**

[*Clauses 0.4 and 5.1.2(b)*]

GROUND TEMPERATURE °C	15	20	25	30	35	40	45
RATING FACTOR	1.17	1.12	1.06	1.00	0.94	0.87	0.79

**TABLE 12 RATING FACTORS FOR VARIATION IN THERMAL RESISTIVITY
OF SOIL (TWIN AND MULTI-CORE CABLES IN SINGLE WAY DUCTS)**

[*Clauses 0.4 and 5.1.2(c)*]

NOMINAL AREA OF CONDUCTOR mm ²	FOR VALUES OF THERMAL RESISTIVITY OF SOIL IN °C cm/W					
	100	120	150	200	250	300
1.5	1.05	1.03	1.00	0.96	0.91	0.88
2.5	1.05	1.03	1.00	0.96	0.91	0.88
4	1.05	1.03	1.00	0.96	0.91	0.88
6	1.05	1.03	1.00	0.96	0.91	0.88
10	1.05	1.03	1.00	0.95	0.90	0.87
16	1.06	1.03	1.00	0.95	0.90	0.86
25	1.07	1.04	1.00	0.95	0.90	0.85
35	1.08	1.04	1.00	0.94	0.89	0.84
50	1.08	1.04	1.00	0.94	0.89	0.84
70	1.08	1.04	1.00	0.94	0.88	0.83
95	1.08	1.04	1.00	0.94	0.87	0.83
120	1.09	1.05	1.00	0.94	0.87	0.82
150	1.09	1.05	1.00	0.93	0.86	0.82
185	1.10	1.05	1.00	0.93	0.86	0.81
240	1.10	1.05	1.00	0.92	0.86	0.81
300	1.10	1.05	1.00	0.92	0.86	0.81
400	1.11	1.06	1.00	0.92	0.86	0.81

TABLE 13 RATING FACTORS FOR VARIATION IN THERMAL RESISTIVITY OF SOIL
(TWO AND THREE SINGLE-CORE CABLES IN DUCTS)

[Clauses 0.4 and 5.1.2(c)]

NOMINAL AREA OF CONDUCTOR mm ²	TWO CABLES IN TWO-WAY DUCTS, FOR VALUES OF THERMAL RESISTIVITY OF SOIL IN °C cm/W						THREE CABLES IN TRIFOIL DUCTS, FOR VALUES OF THERMAL RESISTIVITY OF SOIL IN °C cm/W					
	100	120	150	200	250	300	100	120	150	200	250	300
1.5	1.07	1.04	1.00	0.96	0.91	0.86	1.10	1.05	1.00	0.94	0.87	0.83
2.5	1.07	1.04	1.00	0.96	0.91	0.86	1.10	1.05	1.00	0.94	0.87	0.83
4	1.07	1.04	1.00	0.96	0.91	0.86	1.10	1.05	1.00	0.94	0.87	0.83
6	1.07	1.04	1.00	0.96	0.91	0.86	1.10	1.05	1.00	0.94	0.87	0.83
10	1.07	1.04	1.00	0.95	0.90	0.85	1.10	1.05	1.00	0.93	0.86	0.82
16	1.08	1.04	1.00	0.94	0.89	0.84	1.10	1.05	1.00	0.92	0.86	0.81
25	1.08	1.04	1.00	0.94	0.88	0.83	1.10	1.05	1.00	0.92	0.85	0.80
35	1.09	1.05	1.00	0.94	0.87	0.83	1.11	1.06	1.00	0.92	0.85	0.80
50	1.09	1.05	1.00	0.94	0.87	0.83	1.12	1.06	1.00	0.92	0.85	0.80
70	1.09	1.05	1.00	0.94	0.87	0.83	1.12	1.06	1.00	0.91	0.85	0.79
95	1.10	1.05	1.00	0.93	0.86	0.82	1.13	1.06	1.00	0.91	0.84	0.79
120	1.10	1.05	1.00	0.92	0.85	0.81	1.13	1.06	1.00	0.91	0.84	0.78
150	1.10	1.05	1.00	0.92	0.85	0.81	1.14	1.07	1.00	0.91	0.84	0.78
185	1.10	1.05	1.00	0.92	0.85	0.80	1.15	1.08	1.00	0.91	0.84	0.77
240	1.11	1.06	1.00	0.92	0.85	0.80	1.15	1.08	1.00	0.91	0.83	0.77
300	1.12	1.06	1.00	0.92	0.85	0.80	1.15	1.08	1.00	0.90	0.83	0.76
400	1.12	1.06	1.00	0.91	0.85	0.79	1.16	1.08	1.00	0.90	0.83	0.76
500	1.12	1.06	1.00	0.91	0.85	0.79	1.16	1.08	1.00	0.90	0.82	0.76
625	1.13	1.06	1.00	0.91	0.84	0.79	1.17	1.09	1.00	0.90	0.82	0.76

TABLE 14 RATING FACTORS FOR MULTI-WAY DUCTS (FOR USE WHEN A MULTI-WAY DUCT DOES NOT CONTAIN THE FULL NUMBER OF LOADED ARMoured CABLES)

[Clause 5.1.2(d)]

Number of loaded cables	3-Way Duct			6-Way Duct			9-Way Duct		
	1	2		4	5		7	8	
Rating factor	1.15	1.07		1.10	1.04		1.10	1.05	

TABLE 15 GROUP RATING FACTORS FOR TWIN AND MULTI-CORE CABLES IN SINGLE-WAY STONEWARE DUCTS AND IRON PIPES IN TIER FORMATION

[Clause 5.1.2(e)]

FORMATION OF DUCTS (PIPES)

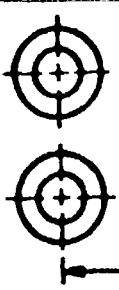
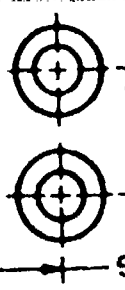





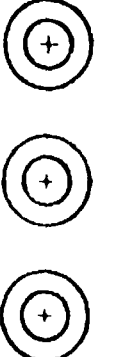
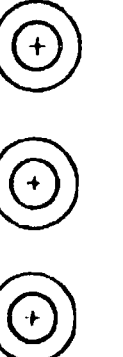
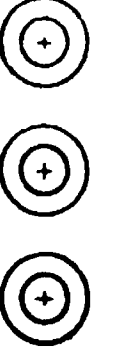
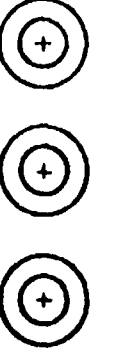
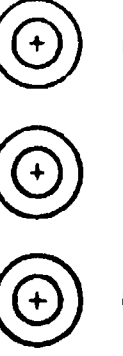
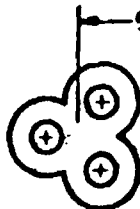
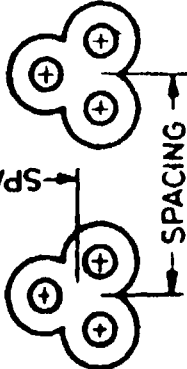
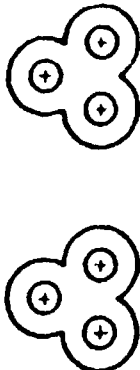

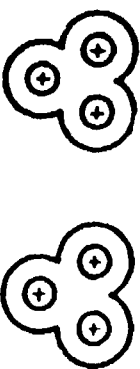
SPACING OF DUCTS (PIPES)	FORMATION OF DUCTS (PIPES)												Rating factor
													
Ducts (pipes) approximately touching	0.76												0.54
30 cm	0.79												0.57
45 cm	0.81												0.60

TABLE 16 GROUP RATING FACTORS FOR SINGLE-CORE CABLES IN TREFOIL STONEWARE
DUCTS IN TIER FORMATION

[Clause 5.1.2(c)]

FORMATION OF DUCTS

  SPACING OF Ducts															
	0.76	0.70	0.64	0.61		0.76	0.70	0.64	0.61		0.76	0.70	0.64	0.61	
Ducts ap- proximately touching 45 cm	0.78	0.73				0.78	0.73				0.78	0.73			

**TABLE 17 RATING FACTORS FOR VARIATION
IN AMBIENT AIR TEMPERATURE**

[Clause 5.1.3(a)]

AIR TEMPERATURE °C	25	30	35	40	45
RATING FACTOR	1.25	1.16	1.09	1.00	0.90

**TABLE 18 RATING FACTORS FOR THREE SINGLE-CORE CABLES (ac)
IN FLAT FORMATION IN AIR (TO BE APPLIED TO THE
CORRESPONDING RATINGS FOR TREFOIL GROUPS IN AIR)**

[Clause 5.1.3(b)]

NOMINAL AREA OF CONDUCTOR	RATING FACTOR
mm ²	
Up to and including 185	1.07
240	1.10
300	1.08
400	1.04
500	1.00
625	1.00

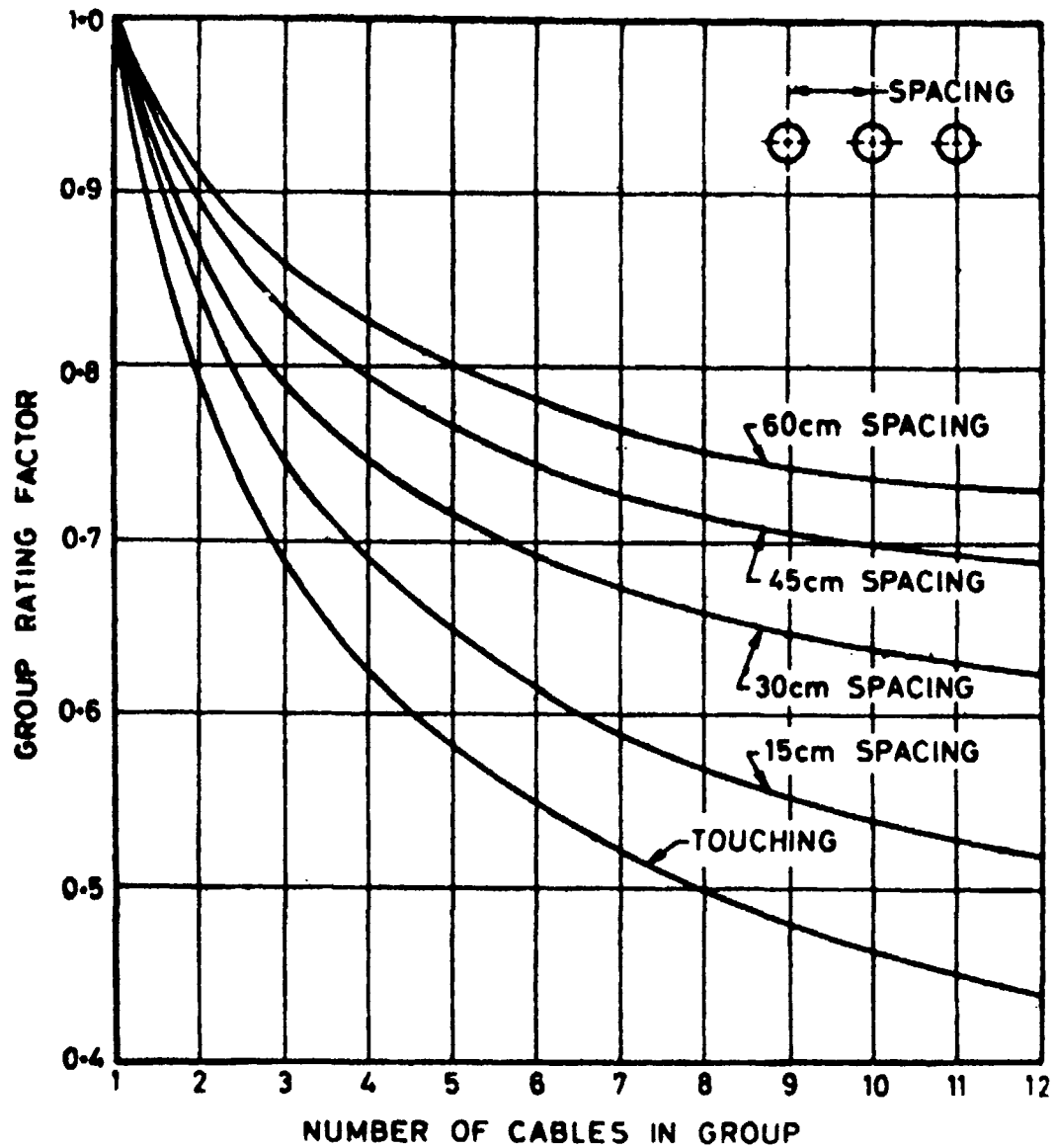


FIG. 1 GROUP RATING FACTORS FOR TWIN AND MULTI-CORE CABLES IN HORIZONTAL FORMATION, LAID DIRECT IN THE GROUND

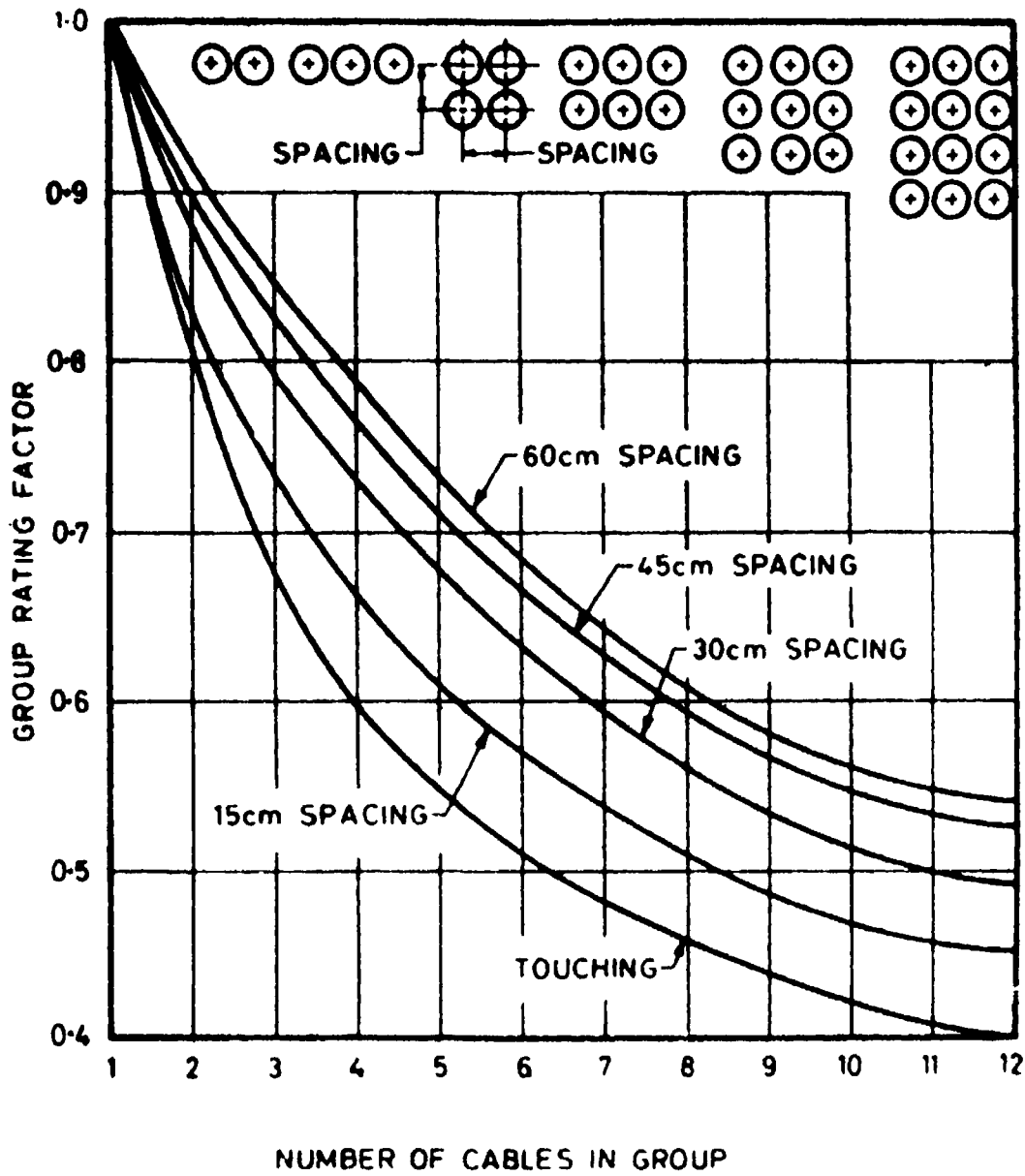


FIG. 2 GROUP RATING FACTORS FOR TWIN AND MULTI-CORE CABLES IN TIER FORMATION, LAID DIRECT IN THE GROUND

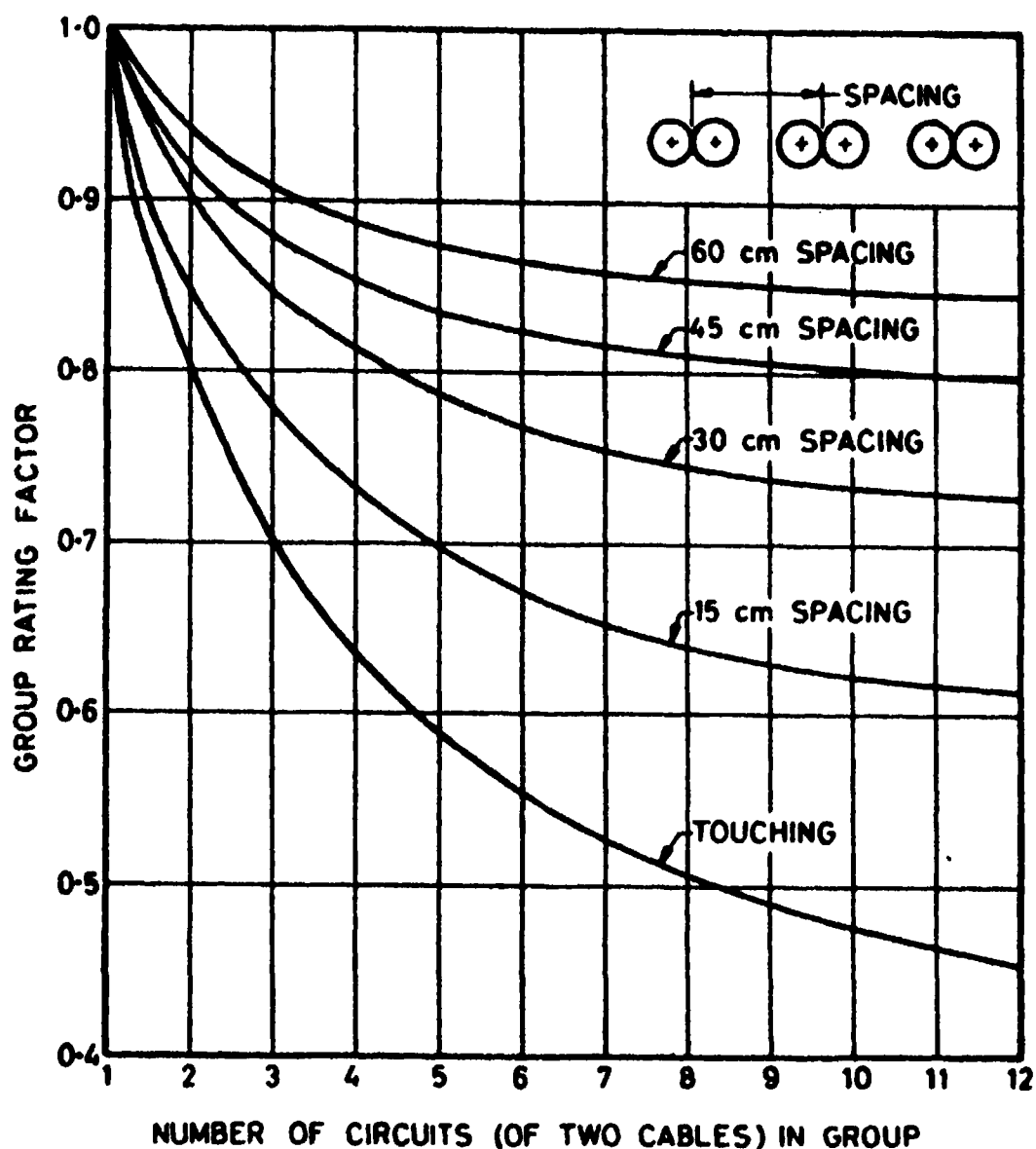


FIG. 3 GROUP RATING FACTORS FOR CIRCUITS OF TWO SINGLE-CORE CABLES SIDE BY SIDE AND TOUCHING, HORIZONTAL FORMATION, LAID DIRECT IN THE GROUND

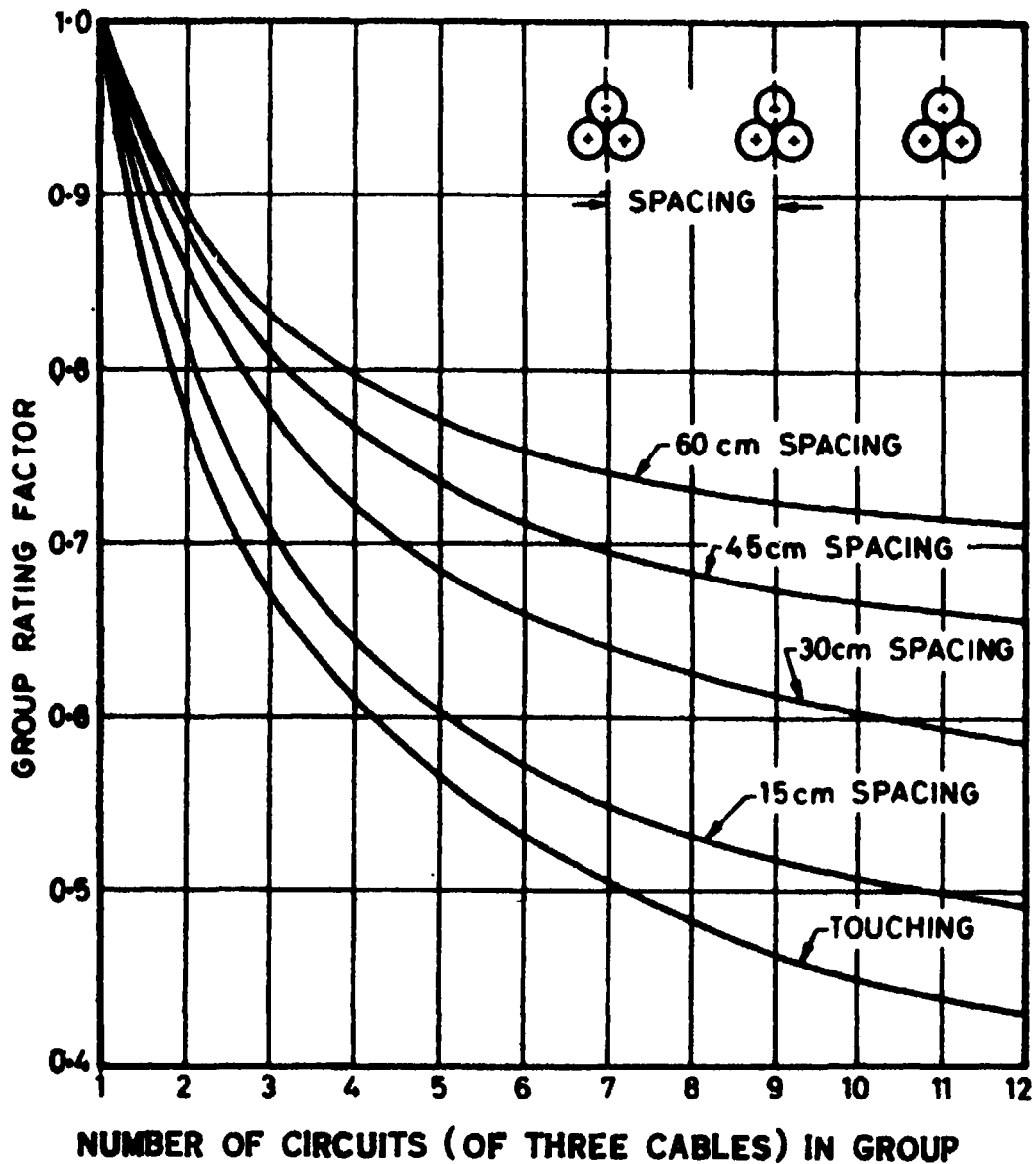


FIG. 4 GROUP RATING FACTORS FOR CIRCUITS OF THREE SINGLE-CORE CABLES IN TREFOIL AND TOUCHING, HORIZONTAL FORMATION, LAID DIRECT IN THE GROUND

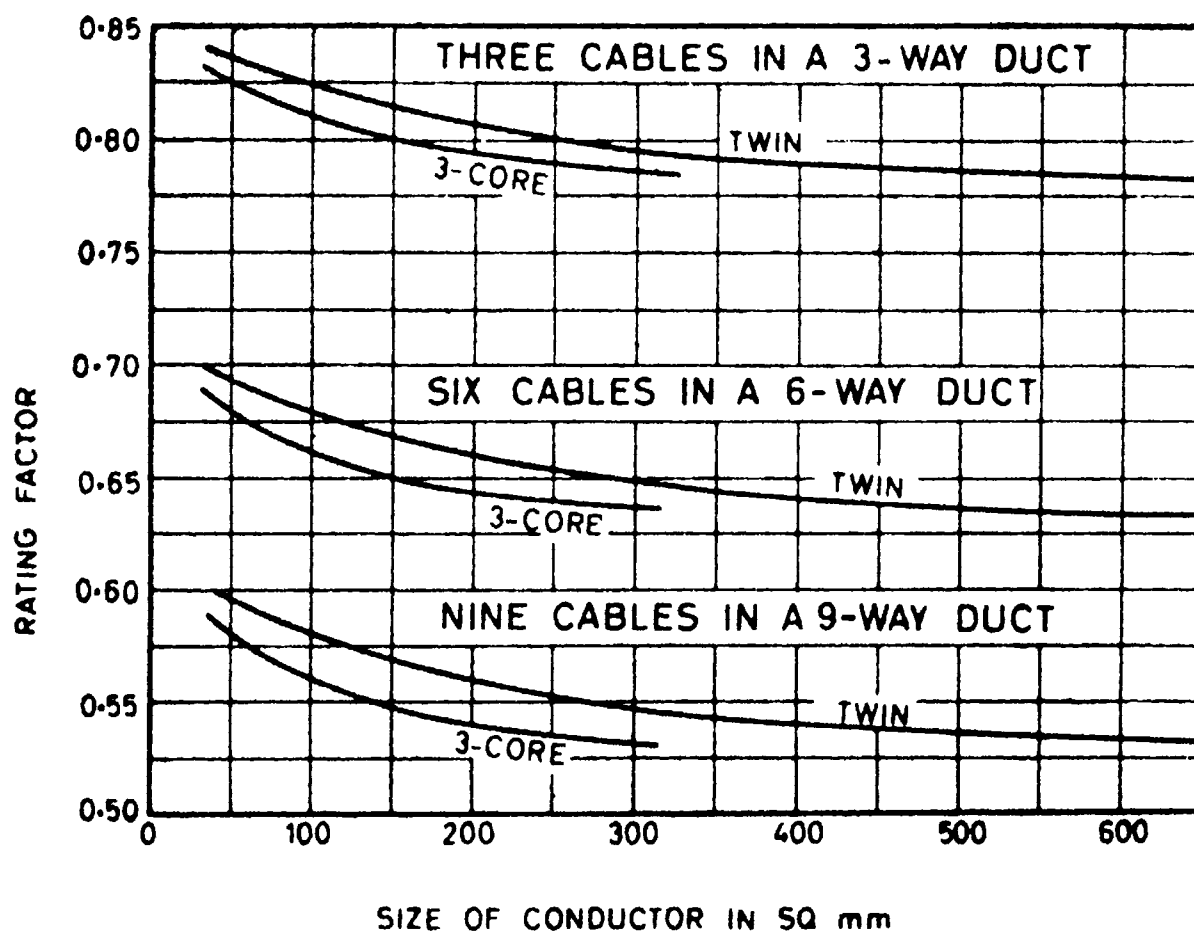


FIG. 5 RATING FACTORS FOR WIRE-ARMoured CABLES IN MULTI-WAY DUCTS (TO BE APPLIED TO RATING OF CORRESPONDING CABLE IN A SINGLE-WAY DUCT TO OBTAIN RATING FOR CABLE IN MULTI-WAY DUCT)

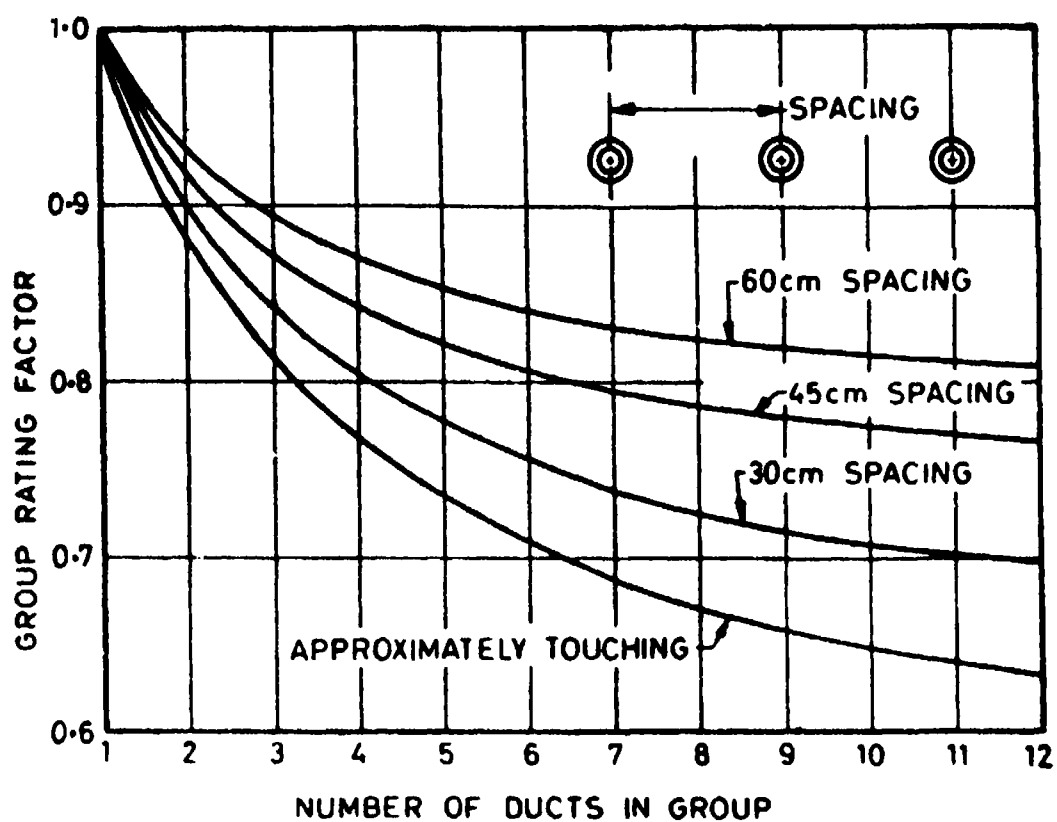


FIG. 6 GROUP RATING FACTORS FOR TWIN AND MULTI-CORE CABLES IN SINGLE-WAY DUCTS AND PIPES HORIZONTAL FORMATION

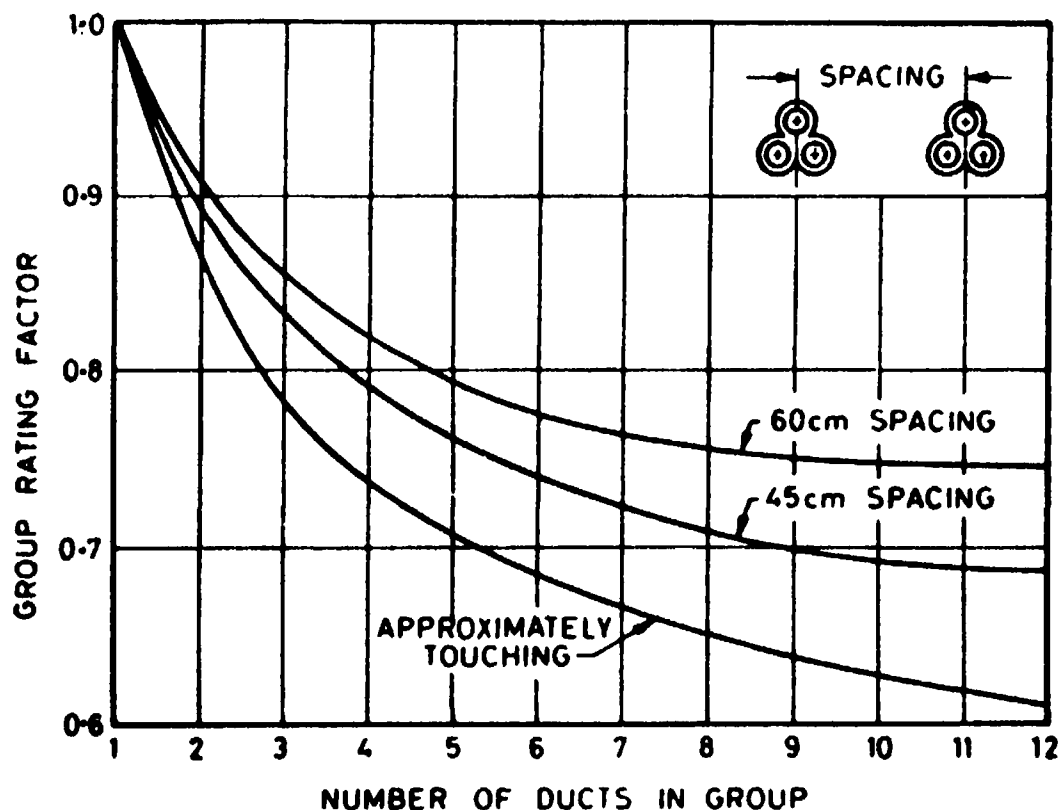


FIG. 7 GROUP RATING FACTORS FOR SINGLE-CORE CABLES IN TREFOIL DUCTS HORIZONTAL FORMATION

(Continued from page 2)

Panel for Current Ratings of the Different Types of Cables,
ETDC 32/P5

Members	Representing
SHRI N. V. RAMAN SHRI M. DEY (Alternate)	Indian Cable Co Ltd, Calcutta
SHRI R. RAMANUJAN SHRI S. KRISHNAMOORTHY (Alternate)	Aluminium Industries Ltd, Kundara
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SHRI P. K. SANKARANARAYANAN DR P. S. SHAH	Asian Cables Corporation Ltd, Bombay Cable Corporation of India Ltd, Bombay

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 323 0131, 323 3375, 323 9402

Fax : 91 11 3234062, 91 11 3239399, 91 11 3239382

Telegrams : Manaksanstha
(Common to all Offices)

Central Laboratory :

Plot No. 20/9, Site IV, Sahibabad Industrial Area, Sahibabad 201010

Telephone

8-77 00 32

Regional Offices:

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 323 76 17

*Eastern : 1/14 CIT Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054 337 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022 60 38 43

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 235 23 15

†Western : Manakalaya, E9, Behind Marol Telephone Exchange, Andheri (East),
MUMBAI 400093 832 92 95

Branch Offices::

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001 550 13 48

‡Peenya Industrial Area, 1st Stage, Bangalore-Tumkur Road,
BANGALORE 560058 839 49 55

Gangotri Complex, 5th Floor, Bhadbhada Road, T.T. Nagar, BHOPAL 462003 55 40 21

Plot No. 62-63, Unit VI, Ganga Nagar, BHUBANESHWAR 751001 40 36 27

Kalaikathir Buildings, 670 Avinashi Road, COIMBATORE 641037 21 01 41

Plot No. 43, Sector 16 A, Mathura Road, FARIDABAD 121001 8-28 88 01

Savitri Complex, 116 G.T. Road, GHAZIABAD 201001 8-71 19 96

53/5 Ward No.29, R.G. Barua Road, 5th By-lane, GUWAHATI 781003 54 11 37

5-8-56C, L.N. Gupta Marg, Nampally Station Road, HYDERABAD 500001 20 10 83

E-52, Chitaranjan Marg, C-Scheme, JAIPUR 302001 37 29 25

117/418 B, Sarvodaya Nagar, KANPUR 208005 21 68 76

Seth Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road,
LUCKNOW 226001 23 89 23

NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010 52 51 71

Patliputra Industrial Estate, PATNA 800013 26 23 05

Institution of Engineers (India) Building 1332 Shivaji Nagar, PUNE 411005 32 36 35

T.C. No. 14/1421, University P. O. Palayam, THIRUVANANTHAPURAM 695034 6 21 17

*Sales Office is at 5 Chowringhee Approach, P.O. Princep Street,
CALCUTTA 700072 27 10 85

†Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007 309 65 28

‡Sales Office is at 'F' Block, Unity Building, Narashimaraja Square,
BANGALORE 560002 222 39 71